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**AD 282 004 L**

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APPLICATION				PART NUMBER	REV SYM	E
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			PROTOTYPE ONLY	-1		
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76202-720-301-00  
76202-730-301-00  
SOURCE CONTROL DRAWING

ORIGINAL SIGNED BY:

J.M. Bottom	6-1-61
B. S. Mill	6-1-61
C. L. Rehkopf	6-1-61
R. R. Miller	6-2-61
S. Howland	9-15-61
G. E. Graham	6-2-61
R. A. Shepherd	

THE **BOEING** COMPANY  
AERO-SPACE DIVISION SEATTLE, WASHINGTON

DYNA-SOAR EJECTION SEAT  
AND SURVIVAL SYSTEM

CODE  
IDENT NO  
81205

SIZE  
**A**

10-81000

NO. OTS

AF 33(657)-7132

H 1 35

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
D	<p>(1) Changed seat back boost position angle from 3 degrees aft to 2 degrees forward and called for adjustable upper arm supports to conform. (2) Revised sled test requirements to call out specific responsibilities and requirements, including heat shield in Appendix B. (3) Made The Boeing Company responsible for the lower half of the tube-cutter electrical disconnect and the pressure switch tube disconnect. (4) Called out rail hole size and rail end chamfer. (5) Called for safety pin in harness release handle. (6) Clarified "D" ring position in Figure 8.</p> <p>Reason: (1) Customer requested new seat back angle for boost. (2) through (6) Completion of basic design and drawing clarification. BO-2-0046.</p>	1/16/62	<p>P. Byrne</p> <p style="text-align: right;">BM</p> <p>GEG 3/16/62</p>
E	<p>(1) Called for an interlock to prevent seat from firing until hatch is jettisoned, including 2 lb weight increase. (2) Called for "controlled failure" of seat back snubber so that the tilt back assembly need not be "beefed up" to take air loads in the boost position. (3) Called for method of quickly removing upper arm supports in order to facilitate tape recorder removal. (4) Called for seat back position indicator so that pilot can determine his position. (5) Add tolerance of <math>\pm 1/2</math> degree to seat back position angle. (6) Called for seat vertical position markings visible from the forward side of fixed rails to facilitate seat installation. (7) Called for separate P/N on seat-man separator and inertia reel. (8) Corrected high temperature test callout. (9) Corrected vibration envelope. (10) Deleted Test No. 4.2.3.20. (11) On Figure 2 removed either input symbol from Emergency Oxygen Box. (12) Revised <del>ejection control force &amp; quantity of -9 from 3 to 4 to agree with item (1) above.</del></p> <p>Reason: Completion of basic design and correct engineering error. BO-2-0086.</p> <p>(1) Called out D2-80396 revision of 4-4-62. (2) Called for movie plan deleted by (1). (3) Deleted requirement for exhaust air fittings in pilot services disconnect. (4) Corrected B-52 performance limits. (5) Called for sled testing at AFMDC, Holloman. (6) Clarified harness location requirements. (7) Clarified ejection control requirements with respect to inadvertent operation. (8) <del>Revised ejection control actuating forces.</del> (9) Revised ejection air load direction. <del>(10) Changed quantity of 10 21000 9 from 3 to 4.</del></p> <p>Reason: Completion of basic design and corrected engineering error. BO-2-9500.</p>	7/3/62	<p>P. Byrne</p> <p style="text-align: right;">BM 7-10-62</p> <p>5 July 62 P. Byrne 7/10 20-21-62</p>

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SCALE	AF	33(657)-7132	SH 20

REV E

## LIST OF ACTIVE PAGES AND CHANGE RECORD

ACTIVE PAGES			CHANGE RECORD			ACTIVE PAGES			CHANGE RECORD		
REV	PAGE NUMBERS	ISSUE	REVISED	ADDED	DELETED	REV	PAGE NUMBERS	ISSUE	REVISED	ADDED	DELETED
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B	1 - 34		1 7-19 21-24 33 31a	2a 13a 23a 31a					31 31a		
C			1 3-4 5-11 13 15-17 19-22 24 31 31a	2b 8a 10a 20a 20b 20c 20d 31b 31c							
D			1 3 4 11 13a 14 15 21 22 23 31a	2a 21a 21b 35							
E			1 2a 3 5 8-12 13a 17 19 20a 20b 21 21a 22 23 24 26	17a 19a	6						
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1	-15	INERTIA REEL CARTRIDGE				R
1	-14	SEAT-MAN SEPARATOR CARTRIDGE				R
1	-13	SOFAR BOMB				
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1	-10	CATAPULT INITIATOR				
4	-9	INITIATOR				R
1	-8	DISCONNECT ASSY, LOWER				
1	-7	DISCONNECT ASSY, UPPER				
1	-6	SEAT ASSEMBLY				
1	-5	FIXED RAIL ASSEMBLY				
1	-4	PARACHUTE ASSEMBLY				
1	-3	ROCKET CATAPULT ASSEMBLY				
1	-2	RESCUE & SURVIVAL KIT CONTAINER ASSEMBLY				
	-1	EJECTION SEAT AND RAIL ASSY (PROTOTYPE ONLY)				
REQD	PART NO.	DESCRIPTION	MATL	MATL SPEC	WT	

## LIST OF MATERIAL

DYNA-SOAR EJECTION SEAT AND  
SURVIVAL SYSTEM

BOEING AIRPLANE COMPANY

10-81000

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					REV E
BAC PT NO.	VENDOR	VENDOR'S PART NUMBER	APPD	WT	APPROVAL LETTER NUMBER AND DATE

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DPA DESIGN PROPOSAL APPROVAL  
FA FINAL APPROVAL  
TA TENTATIVE APPROVAL  
FC FLIGHT CLEARANCE

LFC LIMITED FLIGHT CLEARANCE  
OC OPERATIONAL CLEARANCE  
LOC LIMITED OPERATIONAL CLEARANCE  
NEP NO FUTURE PROCUREMENT

FLAG NOTE  
INFORMATION  
FOUND ON  
PAGE

DYNA-SOAR EJECTION SEAT AND  
SURVIVAL SYSTEM

BOEING AEROSPACE COMPANY

10-81000

P NO. 6

## 1.0 SCOPE

## 1.1 SCOPE.

This drawing covers the design, fabrication, performance and testing requirements for a type of equipment designated Ejection Seat and Survival System.

## 1.2 INTENDED USE AND ASSEMBLY BREAKDOWN

## 1.2.1 EJECTION SEAT AND SURVIVAL SYSTEM.

The specified ejection seat and survival system shall provide for pilot escape and survival from the Dyna-Soar glider in instances when a satisfactory landing site cannot be reached or when other conditions make an attempted glider landing impractical. The complete glider system consists of part numbers 10-81000-2 through 10-81000-15.

The upward ejection seat and rail assembly for the Dyna-Soar vehicle shall be patterned after existing state-of-the-art ejection seats. Size requirements for the pilot are based on a 5th to 75th percentile man, (maximum) fully dressed in a full pressure - body restraint suit system. The pilot's anthropometry shall comply with WADC Technical Report 52-321, "Anthropometry of Flying Personnel", dated September, 1954. A hinged seat back shall provide for two positions of flight; Boost, and Normal Flight/Ejection. A qualified Air Force back type parachute and a seat type rescue and survival kit shall be provided. Ejection sequencing shall be accomplished by actuating a two handed ejection control located on the front edge of the seat bucket between the pilot's legs. This action shall automatically pre-position and restrain the pilot for ejection, eject the hatch, provide system disconnect, supply the pilot suit with bailout oxygen, and fire a rocket catapult. After ejection, automatic seat/man separation shall be provided, with automatic parachute deployment at 14,000 feet or less.

## 1.2.1.1 EJECTION SEAT AND RAIL ASSEMBLY - 10-81000-1 - PROTOTYPE ONLY

The prototype seat and rail assembly shall be a complete system except for the -2 survival kit and -4 Parachute assembly. A dummy catapult and a complete set of dummy ballistic units shall be provided.

## 1.2.1.2 RESCUE AND SURVIVAL KIT CONTAINER ASSEMBLY. 10-81000-2

The rescue and survival kit container assembly will include a bail-out oxygen bottle and regulator system, and will provide storage space for the life raft, rescue aids, and emergency survival equipment. The assembly shall be used as a seat cushion and parachute support during flight.

## 1.2.1.3 ROCKET CATAPULT ASSEMBLY. 10-81000-3

A qualified rocket catapult assembly will consist of the necessary energy for propelling the seat/man/survival equipment from the glider on a safe trajectory before parachute deployment.

## 1.2.1.4 PARACHUTE ASSEMBLY. 10-81000-4

A qualified type B-5 (C-9) or equivalent, back type parachute with modified attachments shall be provided with the ejection seat and survival system.

## 1.2.1.5 FIXED RAIL ASSEMBLY. 10-81000-5

The fixed rail assembly consists of the non-ejectable structure and associated hardware.

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## 1.2.1.6 SEAT ASSEMBLY. 10-81000-6

The seat assembly consists of the ejectable structure and associated hardware.

## 1.2.1.7 DISCONNECT ASSEMBLY, UPPER. 10-81000-7

The upper disconnect assembly consists of the portion of the personal leads disconnect that is attached to the full pressure suit.

## 1.2.1.8 DISCONNECT ASSEMBLY, LOWER. 10-81000-8

The lower disconnect assembly consists of the portion of the personal leads disconnect that is attached to glider structure.

## 1.2.1.9 INITIATOR. 10-81000-9

The initiator is a cartridge actuated device which provides gas pressure for various functions.

## 1.2.1.10 CATAPULT INITIATOR. 10-81000-10

The catapult initiator is a cartridge actuated device which actuates the catapult.

## 1.2.1.11 HARNESS RELEASE INITIATOR. 10-81000-11

The harness release initiator is a cartridge actuated device which actuates the harness release system.

## 1.2.1.12 TUBE CUTTER. 10-81000-12

The tube cutter is a cartridge actuated device which cuts the catapult hose when the emergency external hatch release handle is operated.

## 1.2.1.13 SOFAR BOMB. 10-81000-13

The SOFAR bomb is a sound fixing and ranging bomb.

## 1.2.1.14 SEAT-MAN SEPARATOR CARTRIDGE. 10-81000-14

The seat man separator cartridge operates the seat-man separator.

## 1.2.1.15 INERTIA REEL CARTRIDGE. 10-81000-15

The inertia reel cartridge operates the automatic re-wind on the inertia reel at ejection.

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## 2.0 APPLICABLE DOCUMENTS

2.1 GOVERNMENT. The following Government documents of the exact issue noted, together with the noted revisions thereto constitute a part of this Source Control Drawing, but only to the extent defined herein. In those cases where the document listed is not dated, the issue in effect on the date of invitation for bids, shall form a part of this Source Control Drawing. When conflicting requirements exist, the requirements of this Source Control Drawing shall govern.

MIL-S-9479

Seat: Upward Ejection, Aircraft,  
dated 19 March 1954

MIL-E-5272C

Environmental Testing, Aeronautical  
and Associated Equipment, General  
Spec. For, dated 13 April 1959Federal STD  
No. 595

Colors

WADC Technical  
Report 52-321Anthropometry of Flying Personnel -  
1950, dated September 1954

MIL-C-25918

Cartridge Actuated Devices, Aircraft  
Crew Emergency Escape, General  
Specification For.Air Force Drawing  
52C-1543

Streamer Assembly, Warning

AF Drawing 55C-598

Streamer, Warning, Maintenance,  
Aircraft Escape Systems, Assembly Of.

2.2 NON-GOVERNMENT. The following non-government documents and drawings of exact issues shown, form a part of this Source Control Drawing to the extent specified herein. In those cases where the document is not dated, the latest issue in effect on the date of invitation for bids shall form a part of this Source Control Drawing. One copy each of the documents listed below and marked with an asterisk is to be furnished with each copy of this Source Control Drawing being sent to a Vendor.

\* D2-80396

General Requirements Document for  
Dyna-Soar Source Control Drawings  
and Design Procurement Specifications  
Revised 4-4-62DYNA-SOAR EJECTION SEAT AND  
SURVIVAL SYSTEM

THE BOEING COMPANY

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### 3.0 REQUIREMENTS

#### 3.1 GENERAL REQUIREMENTS

3.1.1 SUPPLEMENTAL DOCUMENT. Requirements, procedures, references, and definitions specified in Document D2-80396 form a part of this Source Control Drawing, except as noted herein. Where conflicting requirements exist, the requirements of this Source Control Drawing shall govern.

3.1.2 MIL SPECIFICATION COMPLIANCE. The general design and development requirements of MIL-S-9479 dated 19 March 1954 shall apply with the exception of deviations as written in this drawing.\* In the event of conflict between this drawing and MIL-S-9479, the requirements of this drawing shall govern.

3.1.3 SYSTEM COMPATIBILITY. The ejection seat and survival system listed below shall be compatible and shall operate as an integrated system to perform the interrelated functions herein defined:

- a. 10-81000-1 Ejection Seat and Rail Assembly (Prototype Only)
- b. 10-81000-2 Rescue and Survival Kit Container Assembly
- c. 10-81000-3 Rocket Catapult Assembly
- d. 10-81000-4 Parachute Assembly
- e. 10-81000-5 Fixed Rail Assembly
- f. 10-81000-6 Seat Assembly
- g. 10-81000-7 Disconnect Assembly, Upper
- h. 10-81000-8 Disconnect Assembly, Lower
- i. 10-81000-9 Initiator
- j. 10-81000-10 Catapult Initiator
- k. 10-81000-11 Harness Release Initiator
- l. 10-81000-12 Tube Cutter
- m. 10-81000-13 SOFAR Bomb
- n. 10-81000-14 Seat-Man Separator Cartridge
- o. 10-81000-15 Inertia Reel Cartridge

The requirements of this drawing shall be considered as applicable in the design of each of the assemblies listed above.

3.1.4 SYSTEMS INTEGRATION. The ejection and survival system shall be so designed that it will meet the performance requirements specified herein when integrated with the full pressure suit - body restraint system, escape hatch ejection system, and glider - pilot service connections. The ejection sequence shall conform to the sequence and integration shown in Figure 2.

\* See Appendix A

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3.1.5 PREPRODUCTION. This specification makes provisions for preproduction testing.

3.1.6 FINISH. All external non-operating surfaces shall be given two coats of Medium Gray lacquer, conforming to color number 36231 of Federal Standard No. 595, except as herein noted.

3.1.7 WEIGHT. The weight of the article shall be a minimum consistent with the performance requirements and within the limitations of sound design practice. It shall not exceed 394.0 pounds (total ejectable and non-ejectable weight). This weight includes the following:

- a. Pilot 176.0 lbs
- b. Survival Container and contents 40.0 lbs

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## 3.1.7 WEIGHT (Continued)

- c. Full Pressure Suit - Body Restraint System 32.5 lbs  
(including hose, electrical wiring and upper  
part of pilot services disconnect and bail-  
out oxygen).

Monthly weight and balance reports shall be submitted as specified in D2-80396, "General Requirements Document for Dyna-Soar Source Control Drawings and Design Procurement Specifications."

3.2 SYSTEM DESIGN. The ejection seat and survival system shall be designed to provide a maximum degree of reliability of operation and require a minimum amount of maintenance. In addition, the seat shall be designed to provide maximum comfort, ease of adjustment (ground maintenance only), simplicity, durability, and minimum weight. Specifications and standard parts shall be selected per D2-80396.

3.2.1 SEAT ADJUSTMENT. The seat shall be designed to provide vertical adjustment and seat back tilt adjustment. Vertical adjustment of the seat will not be required in flight, but will be a preflight operation on the ground.

3.2.1.1 VERTICAL ADJUSTMENT. Preflight vertical seat adjustment shall provide 2.9 inches up, and 1 inch down from the normal seat reference point (SRP) as shown in Figure 1. Markings shall be provided so that it can be determined what position the seat is in from the forward side when installing the catapult in the fixed rails.

## 3.2.1.1.1 DELETED

3.2.1.2 SEAT BACK TILT ADJUSTMENT. The seat back shall be designed to provide manual seat back tilt positioning. The seat positioning lever or control shall be located on the top of the left hand side panel in a convenient and readily accessible position to the pilot or ground crew. Seat back tilt shall provide two positions with stops, namely; "Boost" position  $2^{\circ} + \frac{1}{2}^{\circ}$  forward of normal vertical, and "Ejection" position  $13^{\circ} + \frac{1}{2}^{\circ}$  aft of normal vertical, as shown in Figure 1. The flight position may be selected anyplace between the two positions at the pilot's option. A seat position indicator shall be located in the L. H. arm rest. It shall have the 13 and 3 degree aft and the 2 degree forward positions marked.

For the ejection sequence, the seat back shall be automatically power actuated to the ejection position and locked in place by a ballistic powered actuator or similar device. Electric powered actuators or devices shall not be used. This function shall be included in the seat pre-ejection sequence. Automatic seat back positioning may be incorporated into inertia reel design (paragraph 3.2.6) eliminating the need for a separate seat back positioning actuator. Positioning of seat back to the ejection position under forward accelerations (eyeballs in) shall not result in pilot injury of any kind. Failure of automatic pre-ejection seat positioning shall not prevent seat ejection. (See Figure 2.)

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3.2.2 EQUIPMENT INSTALLATION PROVISIONS. Installation provisions for a qualified B-5 back type personnel parachute assembly with modified attachments as outlined in paragraph 3.2.20, and a rescue and survival kit container assembly as outlined in paragraph 3.2.18, shall be provided in the ejection seat.

3.2.3 SEAT CUSHION. The seat cushion shall be included as part of the rescue and survival kit container assembly. The seat cushion covering material shall be sage green, USAF Color Shade No. 518.

3.2.4 PARACHUTE SUPPORT BULKHEAD. The aft end of the rescue and survival kit container assembly shall provide vertical support for the parachute.

3.2.5 FULL PRESSURE SUIT - BODY RESTRAINT SYSTEM, PARACHUTE AND SURVIVAL GEAR ATTACHMENT. Provisions shall be made for connection of the Full Pressure Suit - Body Restraint System (Government procured - bailment item) to the Ejection Seat and Survival System. Two separate types of fittings are required and are as follows:

(1) Suit to Seat-Parachute-Survival Kit Attach Fittings

Two shoulder and two hip attach fittings are required for attaching the pressure suit to the ejection seat, parachute, and survival gear. These fittings shall be a manual disconnect type which are easily manipulated by the pilot for both ingress and egress from the glider without the parachute or survival kit attached to the suit. The harness assembly from suit to seat shall provide sufficient adjustment to enable the pilot to engage his four attach fittings and tighten the harness for restraint. They will be located on the pressure suit as shown in Figure 8.

The ejection seat Vendor shall design or determine the suit to seat-parachute-survival kit attach fittings and shall transmit to the pressure suit manufacturer the mating pressure suit fitting for incorporation into the pressure suit.

(2) Seat to Suit-Parachute-Survival Kit Attach Fitting

Seat to suit-parachute-survival kit attach fittings shall be located to provide maximum restraint and pilot comfort. They shall be automatically disconnected after catapult rocket burnout but prior to man/seat separation. Automatic actuation of these fittings shall be accomplished by some type of gas cylinder energized by a delay initiator. The automatic release system shall be one direction, i.e., when fittings have opened for man/seat separation they cannot return to the closed position. The delay initiator shall be actuated as the seat travels up the ejection rails.

The initiator actuation mechanism shall be designed so that when the ejectable portion of the seat is installed on the fixed rails, the mechanism is automatically engaged. A device shall be provided which will allow manual removal of the ejection seat without firing the delay initiator.

A single manual release handle, easily accessible to either the pilot or the ground crew, shall release the seat from the suit, parachute and

## 3.2.10 ARM SUPPORTS.

3.2.10.1 UPPER ARM SUPPORT. Arm supports shall be provided on each side of the ejection seat back to provide maximum support to the upper arms of the pilot during boost. The arm supports must clear the 28 inch hatch envelope although they may exceed the nominal 25 inch ejection envelope. The arm supports shall be adjustable for 1.00 inch forward and one inch aft at the nominal position. The adjustment shall be designed such that the top and bottom ends may be moved throughout the adjustment either jointly or separately. They shall be quickly removable to permit access to equipment. See Figure 1, page 23.

3.2.10.2 FOREARM SUPPORT. Forearm supports shall not be provided.

3.2.10.3 ARM SUPPORT UPHOLSTERY. The contact surface of the arm supports shall be padded with a high energy absorbing material. The color of the padded surfaces shall be maroon, No. 21136, per Federal Standard No. 595.

3.2.11 DELETED (Included in paragraph 3.2.1.)

## 3.2.12 EMERGENCY EJECTION CONTROLS AND PROVISIONS

3.2.12.1 EJECTION CONTROL. The seat shall incorporate a two handed control, located on the forward edge of the seat bucket between the pilot's legs. The control shall be conveniently placed so that it may be easily reached for emergency ejection, when in the ejection or boost position and while the pilot is wearing an inflated full pressure - body restraint suit. The position of the control shall be such that it is not a safety hazard, either in flight or on the ground. The design of the control shall be such as to preclude inadvertent operation. The shape and location of the ejection control shall enable the pilot in a pressurized suit to positively grasp the control and initiate the ejection sequence. The handle shall be located approximately as shown in Figure 1. The actuation of this control shall provide an initiation signal for escape hatch ejection as well as the other ejection functions. The control shall have an interlock such that the ejection catapult cannot be fired until the hatch is jettisoned. (The hatch clears the ejection envelope in 100 milliseconds at .90 Mach and in 300 milliseconds at 70 knots at normal operation). The interlock signal shall be a ballistic type, operated by a lanyard attached to the hatch in the vicinity of the R. H. ejectable seat rail. See paragraph 3.2.13. The ejection control shall be painted alternate orange-yellow color No. 23538 and black No. 37038 stripes, per Federal Standard No. 595. The black stripe shall be 1/4" wide and the orange-yellow stripe 3/4" wide. The actuating force shall be 55 pounds minimum and 65 pounds maximum.

3.2.12.2 ACTUATING LINKAGES. All linkages used for firing initiators shall be irreversible; i.e., it shall be impossible to fire any initiator except by the intended sequence of motions. Where initiators are employed in conjunction with the integrated full pressure - body restraint suit releases, shields or guards shall be employed to preclude the possibility of inadvertent firing. No unshielded cables or lanyards shall be used to actuate initiators. Push-pull type controls shall not be used unless they can meet the irreversibility requirement. All actuating mechanisms shall be so located or shielded that they will not tend to catch on clothing of pilot or servicing personnel, or to serve as hand holds. No linkage shall depend on locknuts to keep adjustment, but shall be non-adjustable or shall be pinned or otherwise permanently fastened after an initial adjustment for required travel.

3.2.12.3 DELETED.

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### 3.3 EJECTION SEAT AND SURVIVAL SYSTEM CONSTRUCTION

3.3.1 STRENGTH REQUIREMENTS. All ultimate loads specified in the following sub-paragraphs are 1 1/2 times the proof loads and are based on a weight of 394 pounds maximum as specified in paragraph 3.1.7. All design conditions are to be considered with the seat back both full aft and full forward, except as noted.

#### 3.3.1.1 EJECTION LOADS

3.3.1.1.1 PERSONNEL CATAPULT LOAD. The ejection seat and survival system shall withstand an ultimate load of 1 1/2 times the maximum catapult thrust applied downward parallel to the centerline of the rollers or slide blocks and through the combined center of gravity of the seat occupant with the seat adjusted to the most structurally critical position. In determining the combined center of gravity, the center of gravity of the seat occupant may be considered as being 11 inches forward (measured parallel to the seat bucket bottom) and 9 inches above (measured parallel to the seat back) the seat reference point. See Figure 1. The load shall be transferred to the seat bottom.

3.3.1.1.2 AIR LOAD. The ejection seat and survival system shall withstand an ultimate ejection air load of 1 1/2 times the force imposed upon the seat and its occupant, created by the wind blast from ejection at a "q" of 900 pounds per square foot dynamic pressure. This force shall be applied parallel to the glider waterline and through the combined center of pressure of the exposed portion of the seat and its occupant, distributed over that portion of the seat back exposed to the air stream. For application of this load, the seat shall be positioned with the minimum amount of controlled engagement with the fixed rails. The air load shall be applied with the personnel catapult load applied as noted in paragraph 3.3.1.1.1, except this load shall be the load the catapult would exert with the seat at this position in the rails. The top glider contour ~~in the region of the seat rails is~~ in the region of the seat rails is shown in Figure 1. The tilting seat back assembly need not be designed to take these loads in the forward position if a "controlled failure" is provided. This "controlled failure" (allowing the seat back to move aft against the rails) shall not result in pilot injury. The failure point shall be above vehicle boost loads.

3.3.1.1.3 VEHICLE LOAD FACTORS. During ejection, the ejection seat and survival system shall withstand an ultimate load of 1 1/2 times the following vehicle limit load factors.

- (a)  $\pm 2.5$  normal to glider  $\bar{g}$  (+ down)
- (b)  $- 1.8$  longitudinal (+ forward)

These loads shall be applied with the seat in the position noted in paragraph 3.3.1.1.2. In addition, they shall be applied with the air load specified in paragraph 3.3.1.1.2 and with and without the catapult load specified in paragraph 3.3.1.1.1.

#### 3.3.1.2 DELETED.

3.3.1.3 BOOST LOAD. The ejection seat and survival system shall withstand a 10.5 "g" ultimate load applied aft, parallel to the longitudinal centerline of the glider. The seat shall be adjusted to its most critical position for application of this load.

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3.3.1.4 FRONT EDGE OF SEAT BUCKET. The seat shall withstand a load of 400 pounds ultimate, applied downward to the top front edge of the seat bottom over a length extending 1 1/2 inches to each side of the center of the seat, with the seat bottom horizontal.

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## 3.4.1 CONTINUED

for the glider flying alone. Glider to B-52 dimensional relationship is shown in Figure 5. Clearance of the B-52 tail in the side view is not required, since the maximum yaw angle of the B-52 does not result in a collision path of the seat and tail.

For ground level ejection within the velocity limits specified, the trajectory shall provide sufficient altitude and/or duration for complete parachute deployment and inflation to insure pilot safety. Figure 6, 6a, and 6b show calculated approximate ground level ejection trajectories without parachute deployment. Stability of seat/man combination during ejection shall be such that neither the seat/man separation, nor parachute deployment is compromised.

The seat/man/catapult combination shall be so designed that ejection, within the limits of the escape envelope, shall not produce resultant damaging accelerations on the pilot.

3.4.2 ENVIRONMENTAL REQUIREMENTS. The design of the ejection seat and survival system shall be adequate to obtain the desired performance characteristics and service life under the following environmental conditions:

3.4.2.1 TEMPERATURE AND ALTITUDE. The ejection seat and survival system shall be designed to operate satisfactorily through an ambient operational temperature range of +35°F to 160°F, and from an altitude of sea level to 94,500 feet. It shall be designed to withstand -65°F for 8 hours during transportation.

3.4.2.2 VIBRATION AND DYNAMIC REQUIREMENTS. The system components shall protect the pilot from injury when subjected to the vibrations and dynamic loads encountered in the Dyna-Sear mission, as well as those encountered during ejection and seat/man separation. The vibration envelope for a normal mission is shown in Figure 7.

3.4.2.3 HUMIDITY. The assembly shall be designed to operate satisfactorily after exposure to 100% relative humidity for 240 hours.

3.4.2.4 SALT SPRAY. The assembly shall be designed to withstand a salt air environment.

3.4.2.5 FUNGUS RESISTANCE. Non-nutrient materials shall be used in all possible locations. Nutrient materials shall be protected against fungus.

3.4.3 RELIABILITY. The minimum overall system reliability shall be 986. This number includes the period from initiation of the ejection sequence until the parachute is deployed. The achieved reliability will be determined by analytical means utilizing data from pre-production testing in conjunction with component reliabilities established by the industry. See paragraph 4.4.18. A .99985 reliability for The Boeing Company hatch release and jettisoning system shall be used in overall system reliability analysis. All of the requirements of D2-80396, Section 7.0 shall be fulfilled with the exception of the following paragraphs: 7.1.2.1.e(2), 7.1.2.1.f, 7.1.3.1.

3.5 LOGISTICS DATA AND SPARES SUPPORT. The requirements of D2-80396, Section 15.0, paragraphs 15.4, 15.7, and 15.8 only, shall be fulfilled.

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3.6 Documentary Film Plan - The Boeing Company is required to provide motion picture progress reports on the Dyna-Sear program. Accordingly, the seat Vendor shall prepare a plan for a documentary type film for Boeing approval.

3.6.1 The plan should call for (but not be limited to) filming the following events:

- a. Coverage of sled testing. Pretest coverage of test sled and test preparation, including appropriate closeups of ejection seat, escape hatch, window heat shield, and significant mechanisms; installation of anthropomorphic dummy into seat, and instrumentation of dummy. Highlights of dynamic testing of escape hatch, window heat shield, ejection seat (including separation, trajectory, and descent if possible).
- b. Highlights of static testing.
- c. Highlights of ground firing. (Zero velocity).

3.6.2 The plan shall include the following general requirements:

3.6.2.1. All motion picture coverage should be of a professional photographic quality, scope, and quantity to permit contractor flexibility in editing for production of a factual report on the accomplishment of test objectives.

3.6.2.2. Eastman Commercial Ektachrome (ECO Type 7255) 16 mm. film is preferred and should be used whenever possible (for daylight, use #85 filter).

3.6.2.3. Ample run-in footage prior to start of action, and over-run after action ceases should be included to permit editing flexibility.

3.6.2.4. It is desirable that each scene be slated and a scene list identifying the film scenes accompany the film shipment.

3.6.2.5. Supplementary artificial lighting should be used for any interior coverage rather than existing light. Attempts should be made to keep Kelvin degrees uniform during all interior photography.

3.6.2.6. High speed color photography is desirable whenever the test condition is such that action can best be shown in this manner.

3.6.2.7. Original film or camera-position master made from the original film is desired. The film should be uncut except to remove bad takes ((gross over or under-exposure, out-of-focus footage, etc.)). The reproducible film must not be projected.

3.6.2.8. Film cans should be sealed with tape and conspicuously labeled, "Critical Film Material -- Do Not Open."

Forward film as soon as possible via registered airmail to The Boeing Company, Box 3996, Seattle, Washington; Attention L. J. McShane, Mail Stop 30-05.

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- 4.2.3.10 Structural Test (4.4.10)
- 4.2.3.11 Zero Velocity Test (4.4.11)
- 4.2.3.12 High Temperature Test (4.4.12)
- 4.2.3.13 Low Temperature (4.4.13)
- 4.2.3.14 Vibration Test (4.4.14)
- 4.2.3.15 Humidity Test (4.4.15)
- 4.2.3.16 Salt Spray (4.4.16)
- 4.2.3.17 Fungus (4.4.17)
- 4.2.3.18 Reliability (4.4.18)
- 4.2.3.19 Sled Test (4.4.19)
- 4.2.3.20 DELETED

4.3 ACCEPTANCE (FUNCTIONAL) TESTS. The acceptance test shall include, but not be limited by, the following requirements.

4.3.1 SURVEILLANCE. The Vendor's test configuration shall be subject to on-site evaluation by Boeing (at Boeing option) to verify suitability of test equipment/test setup, and to make sure the test procedures are correct and complete. Acceptance tests do not require any cartridge actuated device firings.

4.3.2 INDIVIDUAL TESTS REQUIRED. 100% Acceptance testing is required.

- 4.3.2.1 Examination of Product (4.4.1)
- 4.3.2.2 Seat Positioning Test (4.4.2)
- 4.3.2.3 Pilot Release System Test (4.4.3)
- 4.3.2.4 Inertia Reel Test (4.4.4)
- 4.3.2.5 Head Rest Test (4.4.6)
- 4.3.2.6 Ejection Controls Test (4.4.7)
- 4.3.2.7 Survival Kit Test (4.4.20)

#### 4.4 TEST REQUIREMENTS

4.4.1 EXAMINATION OF PRODUCT. Each unit shall be inspected to determine compliance with the requirements specified herein and in D2-80396, "General Requirements Document for Dyna-Soar Source Control Drawings and Design Procurement Specifications" with respect to materials, markings, and general workmanship.

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4.4.2 SEAT ADJUSTMENT TEST. Demonstrate the ability of the seat to meet the positioning requirements of paragraph 3.2.1 through 3.2.1.2.

4.4.3 PILOT RELEASE SYSTEM TEST. Demonstrate the ability of the harness release system to meet the requirements of paragraph 3.2.5.

4.4.4 INERTIA REEL TEST. Demonstrate the ability of the inertia reel to meet the requirements of paragraph 3.2.6.

4.4.5 MAN-SEAT SEPARATOR TEST. Demonstrate the ability of the man-seat separator to meet the requirements of paragraph 3.2.7.

4.4.6 HEAD-REST. Demonstrate the ability of the head rest to meet the requirements of paragraph 3.2.8.

4.4.7 EJECTION CONTROLS TEST. Demonstrate the ability of the ejection controls to meet the requirements of paragraph 3.2.12.

4.4.8 SEAT CATAPULT DEACTIVATION TEST. Demonstrate the ability of the seat catapult deactivation device to meet the requirements of paragraph 3.2.13.2.

4.4.9 SOFAR BOMB TEST. Demonstrate the ability of the SOFAR bomb to meet the requirements of paragraph 3.2.21.

4.4.10 STRUCTURAL TEST. Demonstrate the ability of the seat to withstand the ultimate loads specified in paragraph 3.3 without failure.

4.4.11 ZERO VELOCITY TEST. At least one static ground firing shall be conducted to investigate the zero velocity capabilities of the system.

4.4.12 HIGH TEMPERATURE TEST. The assembly shall be tested per paragraph 4.1.2 of MIL-E-5272C, except that the cartridge actuated devices shall soak for a period of three hours after their cases have reached the test temperature. The assembly shall be operated while still at test temperature.

4.4.13 LOW TEMPERATURE TEST. Testing is not required.

4.4.14 VIBRATION TEST.

4.4.14.1 TEST INSTALLATION. The equipment shall be mounted on a suitable vibrator using a rigid fixture. The attachment to the fixture shall be identical to the service installation. The fixture shall be sufficiently rigid to eliminate fixture resonances in the test frequency range, if possible. Provisions shall be made to monitor the input vibrations at the equipment mounting points.

The weight of the assembly and of the vibrator table plus fixture, brackets, etc., shall be determined and entered in the test report.

The installation shall be balanced if necessary to minimize rocking of the vibrator table or test fixture.

4.4.14.2 INSTRUMENTATION REQUIREMENTS. For all vibration tests, monitor accelerometers shall be mounted at two or more of the points of attachment of the test item to its brackets or fixture, with sensing axes parallel to the vibrator motion. These accelerometers shall be monitored continuously during the tests,

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4.4.19. SLED TESTS. The seat supplier shall perform these tests as test contractor or test conductor (in conjunction with AFMDC Track Test Division) under Boeing surveillance. As such, the Supplier will manage the test program at the test site and will be the direct agent dealing with the AFMDC Track Test Division. Boeing coordination with the AFMDC Track Test Division will be through the test contractor.

For the seat ejection system, the seat supplier will be responsible for the design, test and qualification of the complete system, sub-assemblies and parts. For the hatch and hatch jettison system, the seat supplier is not responsible for the design, fabrication or performance of the system or components. He will be responsible for preparing and conducting the tests, including designated instrumentation, and supplying test data.

For the heat shield, the test contractor, as in the case of the hatch system, is not responsible for the design, fabrication or performance of the system or components. He will be responsible for preparing and conducting the tests, including designated portions of the instrumentation, and supplying test data in accordance with Appendix "B" of this drawing.

A Government-furnished full pressure suit will be used (on a 75th percentile dummy) on all ejection system tests. These tests will be considered final Air Force qualification of the suit and attached connections. The test contractor will not be responsible for any qualification on this article. No suit instrumentation will be required. Maintenance of the suits or any particular requirements for the suits during the test program will be furnished by the Air Force or the suit contractor.

The test contractor will provide Boeing (and AFMDC as required) installation drawings prepared by him, of test items, lists of equipment furnished by him, and supporting data prepared by him, associated with the program. He will be responsible for full engineering and liaison support at the test site for all hardware and test equipment for which he is responsible. He will provide technicians or specialists needed to maintain test and associated equipment as required by the AFMDC. He will provide routine maintenance on Boeing furnished items, but he will not be responsible for major maintenance, rework or refurbishment of Boeing articles unless by special arrangement with Boeing.

The test contractor will provide interim reports after each sled run, with a copy to AFMDC. These will include test conditions and results, data reduced from the run, detail failure analysis of the ejection system and recommended action preparatory to the next test run. Detail failure analysis of the hatch and its jettison system or the heat shield and its jettison system, will be the responsibility of Boeing, and not the test contractor.

The Air Force has agreed to furnish all test data reduction from the AFMDC facility. However, the test contractor is not relieved of the responsibility of insuring timely reduction of the ejection system test data. He will not be required to assume responsibility for the hatch and heat shield data reduction, that is distinct from the ejection initiation system, although this too will be performed by the AFMDC and, as such, is to be packaged into the interim reports.

The test contractor will be responsible for prompt acquisition and transmittal to

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## 4.4.19 CONTINUED

Boeing of all test data as soon as available from AFMDC.

A final and detailed test report will be required, suitable for demonstration of the performance qualification of the complete ejection system. Boeing will perform any added final reporting required for the hatch and heat shield systems.

The test contractor will be responsible for test area cleanup, disposition, and any required shipment of test equipment.

4.4.19.1 The sled test program will consist of the following minimum requirements. Four ejection seat runs will be planned. Three runs will be accomplished (one each) at velocities of 70 K, 400 K and 510 knots. They do not necessarily have to proceed in this order. The fourth run will be reserved for accumulated pick-up items, or possible ejection under acceleration, simulating direct ejection during boost. One sled drag calibration run will be planned prior to any test runs.

4.4.19.2 The seat shall withstand the ejection loads and demonstrate satisfactory performance as specified in sections 3.3 and 3.4.

4.4.19.3 Boeing will furnish the test sled vehicle. Boeing will also supply all instrumentation sensors or components that must be integral with Boeing furnished components or sled structure. In addition, all provisions for instrumentation, power supply, camera mounts and access will be supplied with Boeing items in so far as is feasible.

The AFMDC Track Test Division will supply the sled vehicle slippers, and the rocket pusher/water brake sled.

The test contractor will supply all other test items and equipment, including instrumentation, not available from AFMDC. The instrumentation requirements will be worked out between the test contractor and AFMDC, incorporating Boeing furnished requirements for the hatch and heat shield systems.

4.4.19.4 The escape hatch will be tested on all ejection seat sled runs and will be initiated by the normal ejection seat system. Test hardware, special tools and installation instructions will be provided by The Boeing Company.

Test data will consist of time referenced data on hatch motion and trajectory for at least 30 feet of separation, and functioning sequence of initiator ignition and thruster stroke.

Proposed Instrumentation:

- (1) Metric range camera coverage (1000 frames/sec).
- (2) Camera mounted in glider nose or on outrigger, looking aft (1000 frames/sec).
- (3) Cockpit mounted camera looking up (1000 frames/sec).
- (4) Initiation current for each of two parallel ignition circuits. Measure voltage across a current limiting resistor which will be an integral part of the hatch circuit, 0-28 volts, 3 millisecond response.

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4.4.19.6 The anthropomorphic dummy shall be instrumented to measure acceleration forces throughout the ejection, seat separation, and descent sequences.

4.4.19.7 The entire test program will be conducted in accordance with a test plan and detail test procedure to be submitted for Boeing approval in accordance with D2-80396, General Requirements Document for Dyna-Sear Source Control Drawings and Design Procurement Specifications. Boeing test requirements and procedures necessary for the hatch and heat shield are to be furnished by Boeing for inclusion in the subcontractor test plan and procedure.

4.4.20 SURVIVAL KIT TEST. Demonstrate the ability of the survival kit to meet the requirements of paragraph 3.2.18 except that the raft shall not be inflated.

4.4.21 DELETED

#### 5.0 PREPARATION FOR DELIVERY

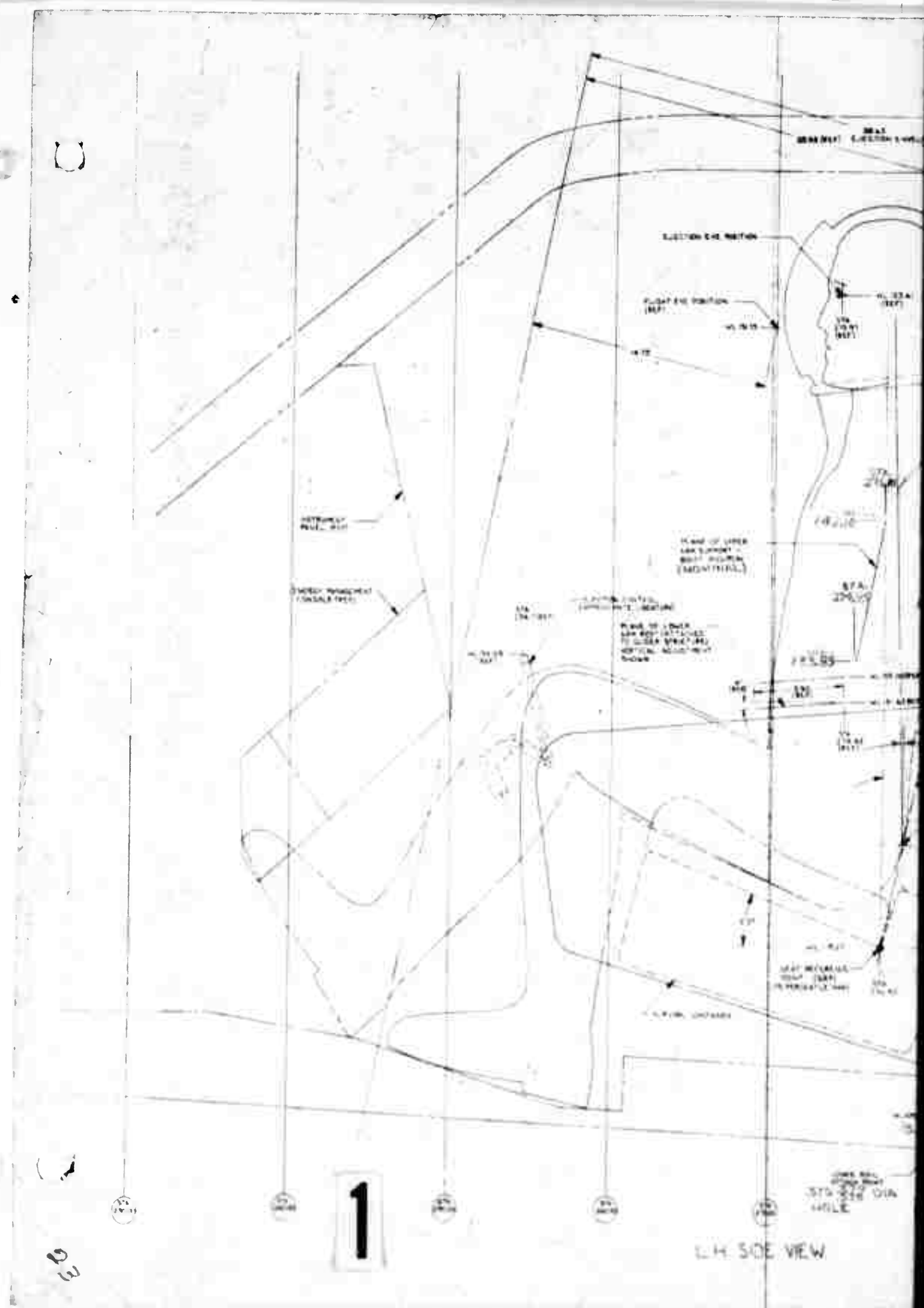
5.1 PREPARATION FOR DELIVERY. Packaging and marking of the article procured by this drawing shall be in accordance with the provisions of D2-80396, General Requirements Document for Dyna-Sear Source Control Drawings and Design Procurement Specifications.

#### 6.0 NOTES.

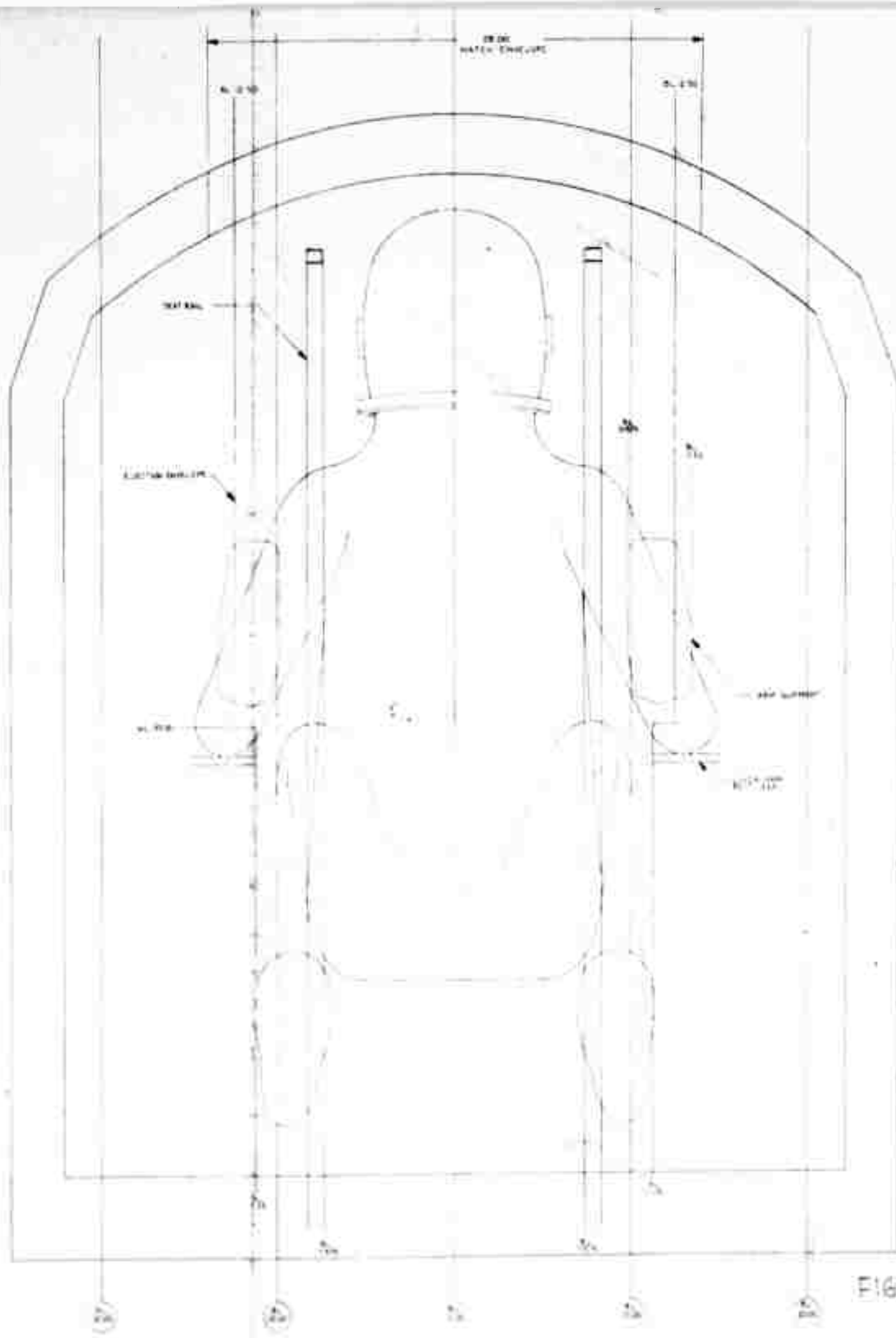
6.1 EJECTION SEAT INTERFACE. Boeing shall provide ejection seat interface design information and conduct all necessary liaison with the Vendor to accomplish service connections from the glider, escape hatch actuation, seat deactivation, and glider structural attachment. The Boeing Company shall provide the seat Vendor master gage tooling for location of rail attach points.

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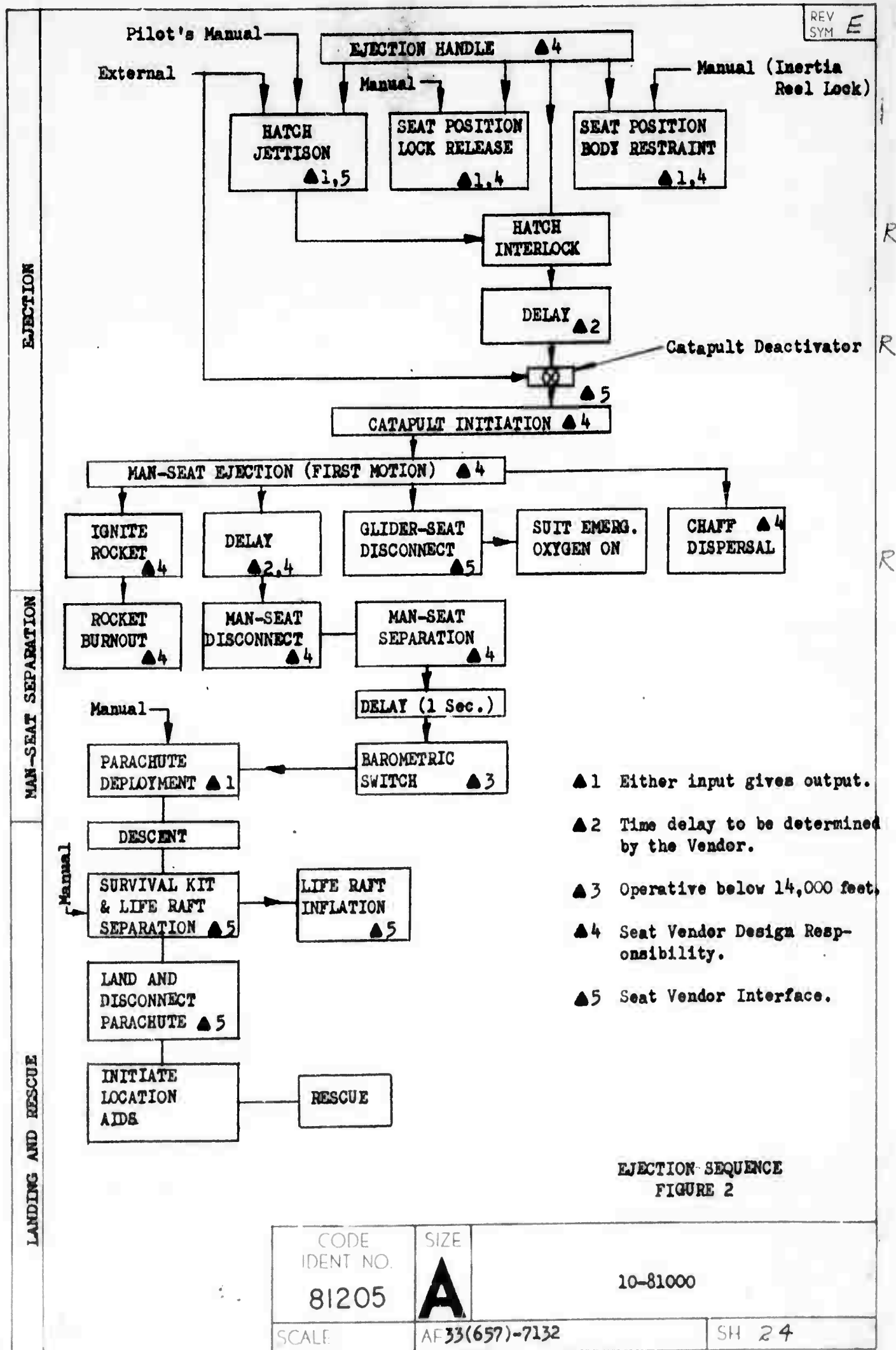




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FIGURE 1

REAR VIEW

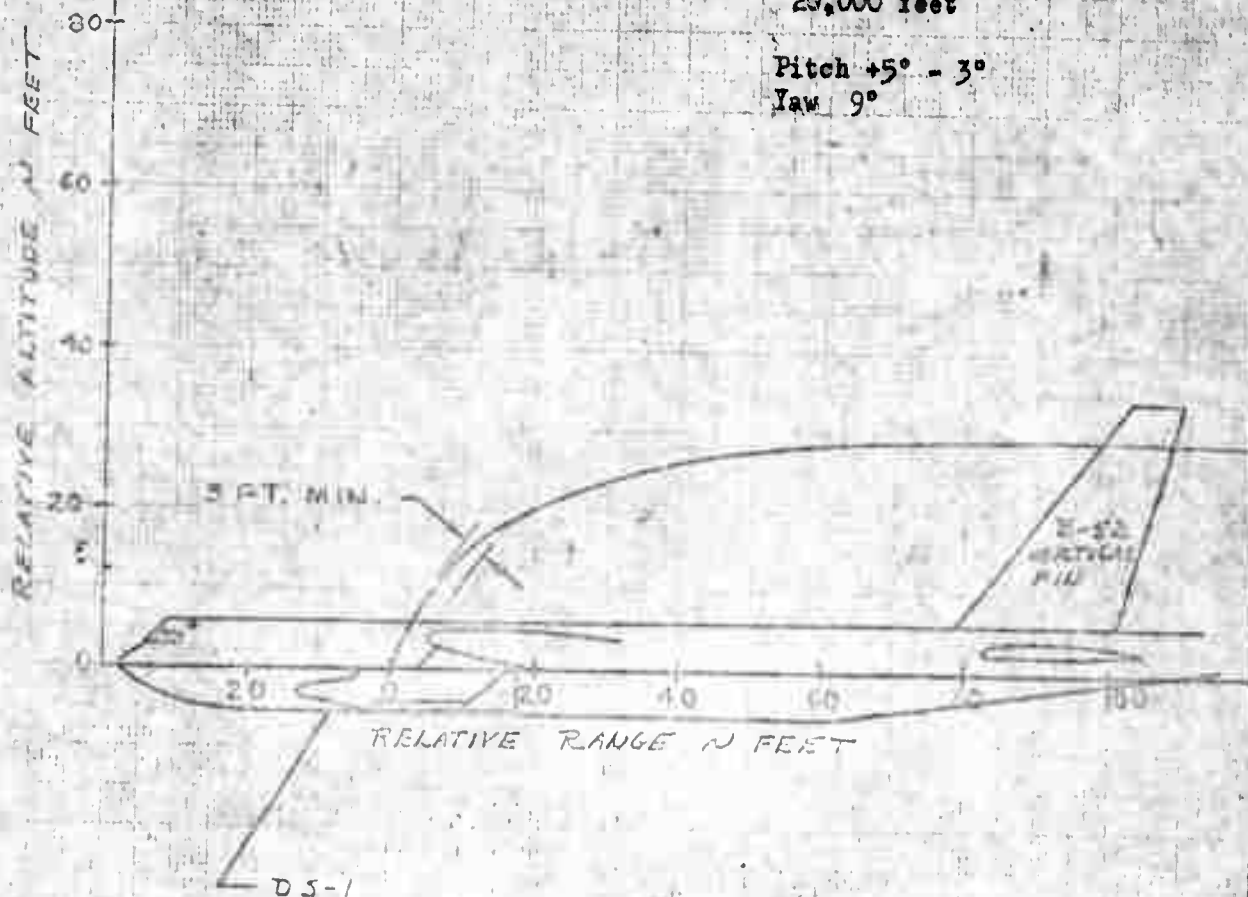


## NOTE:

1. Distance Measured from rear of Glider Escape Hatch.
2. Trajectory appears as it would to an observer riding in the parent vehicle (B-52).

3. Performance Limits (B-52),  
Velocity/Altitude .9 Mach @  
20,000 feet

Pitch  $+5^{\circ}$  -  $3^{\circ}$   
Yaw  $9^{\circ}$



CALC			REVISED	DATE	CLEARANCE ENVELOPE REQUIREMENTS MINIMUM EJECTION TRAJECTORY	FIG 4
CHECK						
APR						10-81000
APR						PAGE
					BOEING AIRPLANE COMPANY	26

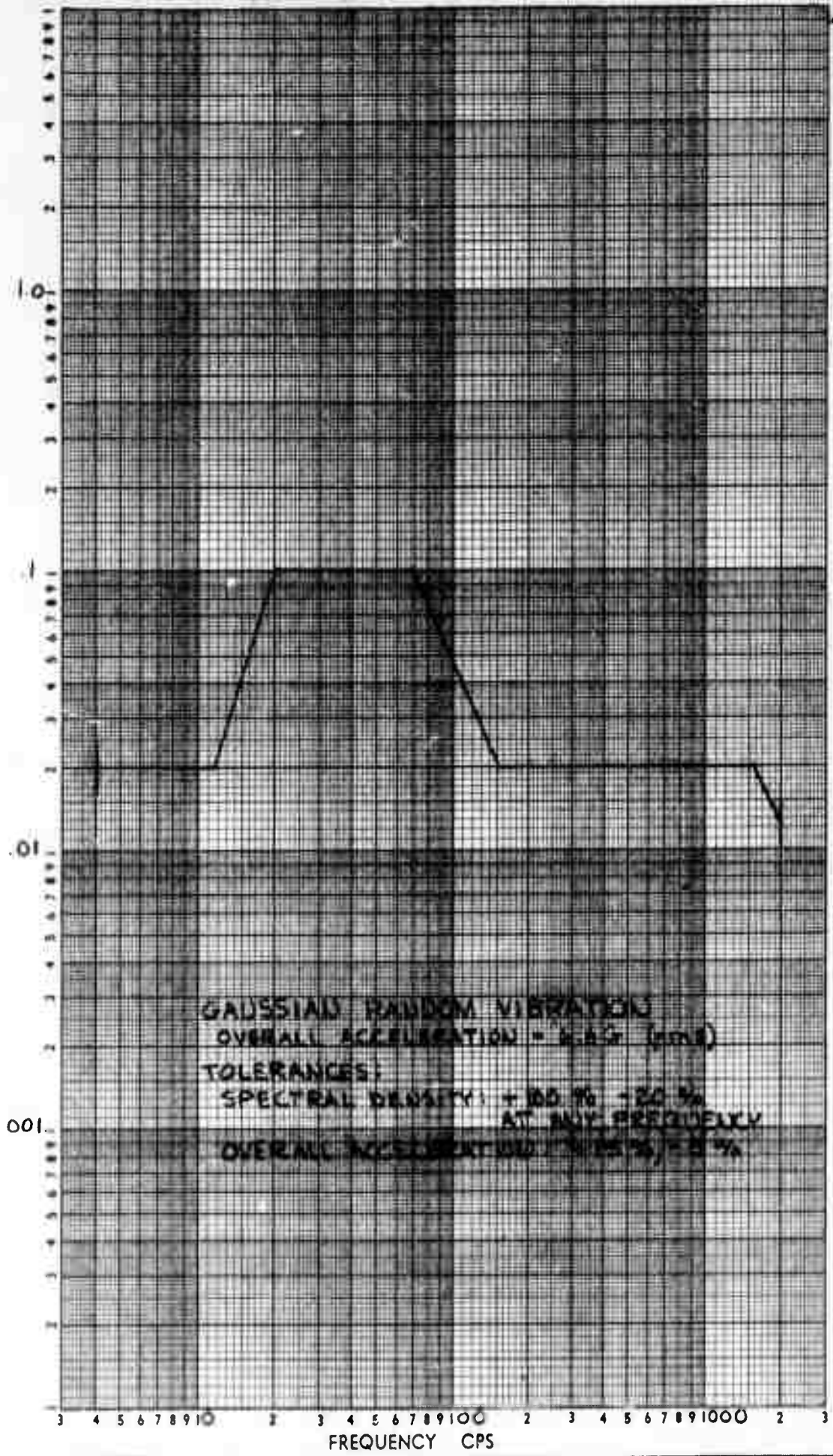
CHANNEL NO.

GROUP NO.

CONDITION NO.

TEST NO.

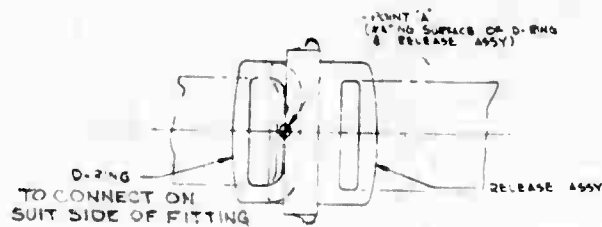
ACCELERATION POWER SPECTRAL DENSITY G<sup>2</sup>/CPS



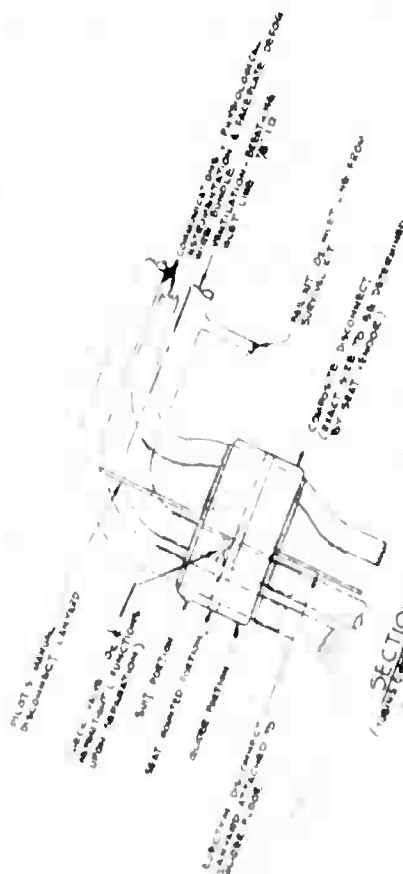
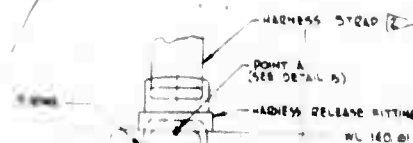
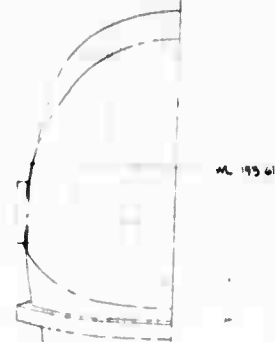
FREQUENCY CPS

CALC			REVISED	DATE	VIBRATION ENVIRONMENTAL REQUIREMENTS	10-B1000
CHECK						FIG. 7
APPR						PAGE 31
APPR						
					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	





DETAIL 3  
HARNESS RELEASE FITTING  
SCALE - FULL SIZE



PILOT SEAT RESTRAINT STRAP FURNISHED WITH SUIT

CLAMP (SEE DETAIL 3)

SURVIVAL CONTAINER RELEASE ASSEMBLY (RELEASES HARNESS CONNECTOR & BACKLASH BY DISCONNECTING SEAT DESIGN SHALL ALLOW CLEARANCE FOR EJECTION)

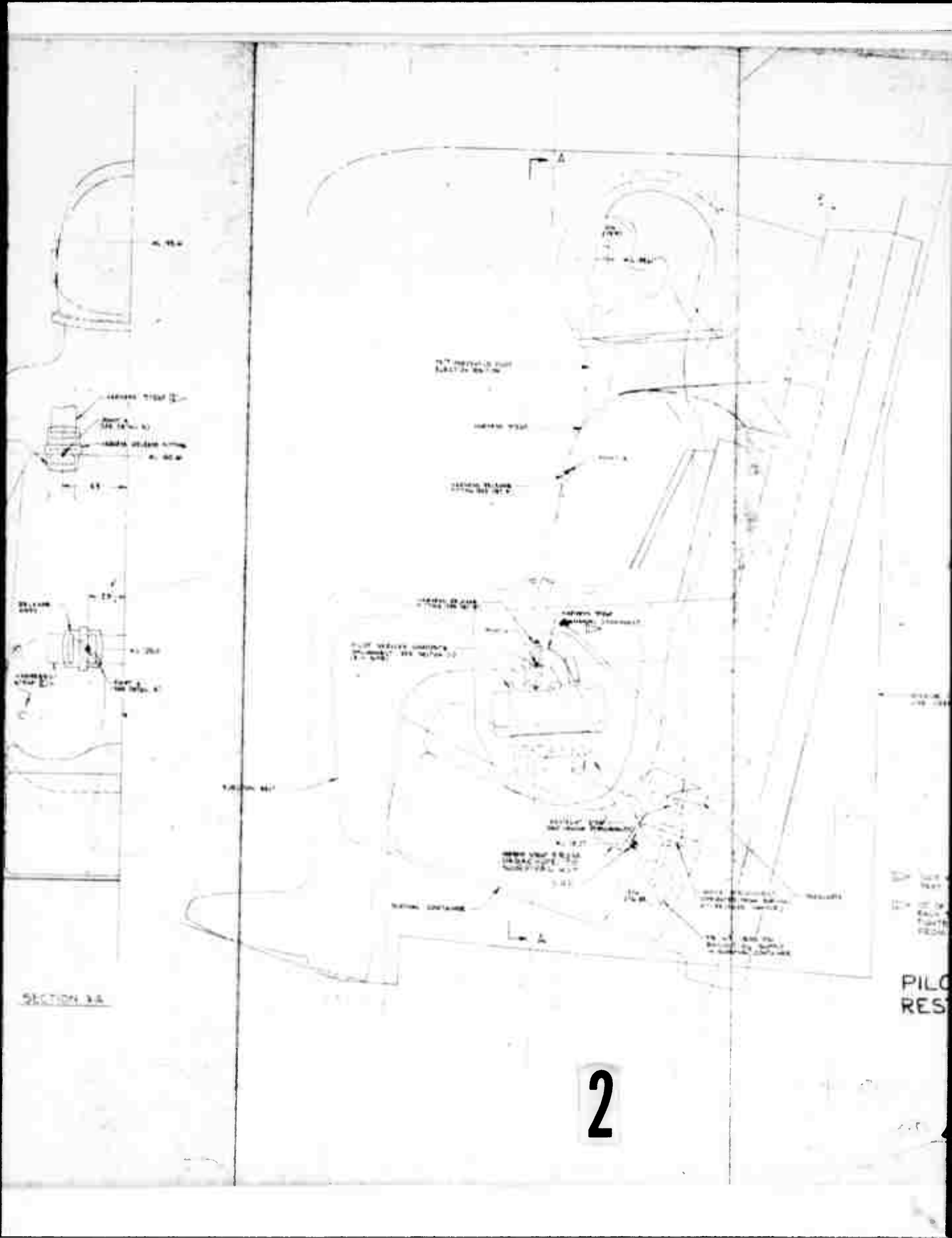
SECTION SEAT

SURVIVAL CONTAINER

SECTION A-A

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